WHAT IS CLAIMED IS:

1. A diamond high brightness ultraviolet ray emitting element comprising:

a diamond substrate; and

a diamond crystal formed on the diamond substrate to high-density excitation;

whereby the light-emitting mechanism a carrier high-density phase which is formed by subjecting a diamond crystal to high-density excitation.

2. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, wherein the high-density excitation has an intensity equal to or greater than 10^{20} cm^{-3} in terms of a carrier density, or equal to or greater than 100 Acm^{-2} in terms of a current density.

3. The diamond high brightness ultraviolet ray emitting element as claimed in claim 2, wherein a region for carrying out the high-density excitation is spatially limited to an area equal to or less than 0.01 cm^2.

4. The diamond high brightness ultraviolet ray emitting element as claimed in claim 3, wherein the region for carrying out the high-density excitation is formed by etching.

5. The diamond high brightness ultraviolet ray emitting

element as claimed in claim 3, wherein the spatial restriction of the region for carrying out the high-density excitation is formed by diamond isolated particles.

6. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, wherein a region for carrying out the high-density excitation is spatially limited to an area equal to or less than 0.01 cm^2.

7. The diamond high brightness ultraviolet ray emitting element as claimed in claim 6, wherein the region for carrying out the high-density excitation is formed by etching.

8. The diamond high brightness ultraviolet ray emitting element as claimed in claim 6, wherein the spatial restriction of the region for carrying out the high-density excitation is formed by diamond isolated particles.

9. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, further comprising a structure for controlling temperature equal to or lower than 170 K when using electron-hole droplets, and equal to or higher than 160 K when using electron-hole plasma.

10. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, further comprising a spatial confinement structure of the carriers.

11. The diamond high brightness ultraviolet ray emitting element as claimed in claim 10, wherein the spatial confinement structure of the carriers comprises a stack of layers including at least two layers with different electric characteristics.

12. The diamond high brightness ultraviolet ray emitting element as claimed in claim 11, wherein the spatial confinement structure of the carriers comprises one of a pn junction and a pin junction.

13. The diamond high brightness ultraviolet ray emitting element as claimed in claim 10, wherein the spatial confinement structure of the carriers comprises one of a pn junction and a pin junction.

14. The diamond high brightness ultraviolet ray emitting element as claimed in claim 13, wherein the one of the pn junction and the pin junction comprises a p-type layer composed of a boron-doped diamond.

15. The diamond high brightness ultraviolet ray emitting element as claimed in claim 13, wherein the one of the pn junction and the pin junction comprises an n-type layer composed of a phosphorus-doped diamond or sulfur-doped diamond.

16. The diamond high brightness ultraviolet ray emitting element as claimed in claim 13, wherein the one of the pn junction and the pin junction comprises electrodes formed on the p-type layer and the n-type layer.

17. The diamond high brightness ultraviolet ray emitting element as claimed in claim 16, wherein said electrodes are composed of titanium.

18. The diamond high brightness ultraviolet ray emitting element as claimed in claim 10, wherein the confinement structure is formed by introducing crystal defects into a region of the crystal by at least one of methods consisting of an impurity doping, neutron beam irradiation, and distortion introduction.

19. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, wherein isotope composition ratio of at least part of the diamond is controlled.

20. The diamond high brightness ultraviolet ray emitting element as claimed in claim 19, wherein purity of ^{12}C or ^{13}C is controlled equal to or greater than 90% in the control of the isotope composition ratio of the diamond.

21. The diamond high brightness ultraviolet ray emitting

element as claimed in claim 1, comprising a diamond substrate that functions as a heat sink.

22. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, wherein the diamond crystal has a nitrogen concentration equal to or less than 10 ppm.

23. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, wherein the diamond crystal has a boron concentration equal to or less than 100 ppm.

24. The diamond high brightness ultraviolet ray emitting element as claimed in claim 1, further comprising an optical cavity, and operating as a laser.

25. The diamond high brightness ultraviolet ray emitting element as claimed in claim 24, wherein a reflection wavelength of reflecting mirrors constituting said optical cavity, and a cavity length are optimized for an emission wavelength of EHD or EHP.

26. The diamond high brightness ultraviolet ray emitting element as claimed in claim 24, wherein said optical cavity comprises reflecting mirror planes formed by etching.

27. The diamond high brightness ultraviolet ray emitting element as claimed in claim 24, wherein said optical cavity

comprises reflecting mirror planes formed by a (111) cleaved plane.

28. The diamond high brightness ultraviolet ray emitting element as claimed in claim 24, wherein said optical cavity comprises reflecting mirror planes formed by a naturally formed plane of isolated particles.

29. The diamond high brightness ultraviolet ray emitting element as claimed in claim 24, wherein said cavity is composed of micro-spheres.

30. The diamond high brightness ultraviolet ray emitting element as claimed in claim 24, wherein said optical cavity comprises reflecting mirrors composed of an Al film.

31. The diamond high brightness ultraviolet ray emitting element as claimed in claim 24, wherein said optical cavity comprises reflecting mirrors composed of a dielectric multilayer film.

32. A bactericidal lamp that employs the diamond high brightness ultraviolet ray emitting element as defined in claim 1 as a light source.

33. A lighting system that employs the diamond high brightness ultraviolet ray emitting element as defined in

claim 1 as a pumping source for fluorescent materials.

34. An optical disk drive that employs the diamond high brightness ultraviolet ray emitting element as defined in claim 1 as a light source for reading information.

35. A semiconductor lithographic exposure system that employs the diamond high brightness ultraviolet ray emitting element as defined in claim 1 as a light source.

36. A semiconductor pattern test system that employs the diamond high brightness ultraviolet ray emitting element as defined in claim 1 as a light source.

37. A medical laser scalpel system that employs the diamond high brightness ultraviolet ray emitting element as defined in claim 1 as a light source.

38. A diamond high brightness ultraviolet ray emitting element comprising:

a diamond substrate;

a first diamond layer formed on the diamond substrate;

a second diamond layer formed on the first diamond layer and functioning as an emission layer;

a third diamond layer formed on the second diamond layer;

a first electrode formed on the first diamond layer; and

a second electrode formed on the third diamond layer, wherein

the second diamond layer constitutes the carrier high-density phase formed by high-density excitation.

39. The diamond high brightness ultraviolet ray emitting element as claimed in claim 38, wherein the high-density excitation has an intensity equal to or greater than 10^{20} cm^{-3} in terms of a carrier density, or equal to or greater than 100 Acm^{-2} in terms of a current density.

40. The diamond high brightness ultraviolet ray emitting element as claimed in claim 38, wherein a region for carrying out the high-density excitation is spatially limited to an area equal to or less than 0.01 cm^2.

41. The diamond high brightness ultraviolet ray emitting element as claimed in claim 38, wherein the region for carrying out the high-density excitation is formed by etching.

42. The diamond high brightness ultraviolet ray emitting element as claimed in claim 38, wherein the spatial restriction of the region for carrying out the high-density

excitation is formed by diamond isolated particles.